

# ABSTRACTS

R. A. REINERS, Editor. ABSTRACTORS: N. E. Bednarczyk, J. G. Endres, J. Iavicoli, K. Kitsuta, F. A. Kummerow, Gladys Macy, E. G. Perkins, T. H. Smouse, J. A. Thompson and R. W. Walker

## • Fats and Oils

OLIVE OILS WITH ABNORMAL IODINE NUMBERS. M. Vitagliano and P. Ruggiero (Univ. of Bari, Bari, Italy). *Riv. Ital. Sostanze Grasse* 45, 686-91 (1968). A study was conducted to identify the causes determining abnormal fatty acid composition and, consequently, abnormal iodine numbers, in olive oils of certain geographical origin (for example, Tunisian oils). The results suggest that the main causative factor in these abnormalities is a delayed picking of the olives. Under the particular climatic conditions of the area involved, the ripening process appears to lead to fairly rapid overripeness. A similar accelerated metabolism is also affected by varietal factors.

ANALYTICAL METHODS FOR MIXTURES OF MONOGLYCERIDES. E. Fedeli, G. Favini and G. Jacini (National Center for Lipochem., Milan, Italy). *Riv. Ital. Sostanze Grasse* 45, 679-82 (1968). Experimental results on the use of some thin-layer and gas chromatographic techniques for the determination of mono-, di- and triglycerides are discussed. Separation is initiated by a TLC treatment, followed either by glycerol titration or by gas chromatography in the presence of a suitable standard. A direct GLC method is also described.

RAPID METHOD FOR FAT DETERMINATION IN SOLID OR SEMI-SOLID SUBSTANCES. P. Armandola (Prov. Chem. Lab., Novara, Italy). *Riv. Ital. Sostanze Grasse* 45, 683-5 (1968). A simple and rapid procedure is described for determining the percentage of fat contained in samples which are solid or semi-solid at room temperature. A modified Gerber butyrolactometer is used in cases where only small amounts of sample are available. The method yields results which are in good agreement with those obtained by traditional extraction methods.

GAS CHROMATOGRAPHIC ANALYSIS OF BUTTER SAMPLES PRODUCED IN THE PROVINCE OF PADUA. E. Benetti (Prov. Chem. Lab., Padua, Italy). *Industria Alimentari* 7(11), 77-8 (1968). The results of gas-chromatographic fatty acid determinations conducted on 40 butter samples over a period of a year are reported. Some of the fatty acid weight ratios which are considered to be typical of butter fat exhibited the following ranges of variation:  $C_{10}/C_8$ : 1.58-2.78;  $C_{12}/C_8$ : 1.81-2.90;  $C_{14}/C_8$ : 5.90-9.26;  $C_{16}/C_8$ : 15.20-24.14;  $C_{18}/C_8$ : 3.95-8.00; and  $C_{18}/C_8$ : 11.74-29.40.

SEED OILS OF THE GENUS ALOE. V. Averna and G. Lotti (Univ. of Palermo, Palermo, Italy). *Riv. Ital. Sostanze Grasse* 45, 675-8 (1968). The results of studies on seed oils from 22 plant species of the genus Aloe are summarized. Data include chemical analysis, fatty acid composition by GLC, I.R. and U.V. spectra. The results indicate a very high degree of variability among species of the oil content of seeds, degree of unsaturation of the oils and their fatty acid composition. For example, the oleic/linoleic ratio varies between 0.2 and 5.9 and the unsaturated/saturated ratio between 0.4 and 6.1.

IDENTIFICATION OF SOME CONSTITUENTS OF CARROT SEED OIL. R. M. Seifert, R. G. Buttery and L. Ling (Western Reg. Res. Lab., U.S. Dept. Agr., Albany, Cal.). *J. Sci. Food Agr.* 19, 383-5 (1968). The composition of carrot seed oil has been studied using gas-liquid chromatography separation of components and characterization by I.R. absorption and mass spectrometry. Evidence was found for the identities of 23 components. Of these, camphene,  $\alpha$ -terpinene, terpinene-4-ol,  $\alpha$ -terpineol, bornyl acetate,  $\gamma$ -decanolactone,  $\beta$ -selinene,  $\alpha$ -gurjunene and coumarin had not been previously reported as constituents of carrot seed oil.

GLYCERIDE STUDIES, VIII. THE COMPONENT GLYCERIDES OF FOUR STROPHANTUS OILS CONTAINING AN UNSATURATED HYDROXY ACID. F. D. Gunstone and M. I. Qureshi (Chem. Dept., Univ. of St. Andrews, Fife, Scotland). *J. Sci. Food Agr.* 19, 386-8 (1968). The glycerides of four *Strophantus* oils containing 6-15% 9-hydroxyoctadec-12-enoic acid have been examined by thin-layer chromatography on silica and on silica-silver nitrate and by lipolysis. The oils show no unusual features in their glyceride composition, the hydroxy acid behaving like linoleic acid in its distribution pattern.

RAPID METHOD FOR THE DETERMINATION OF STEAM-VOLATILE FATTY ACIDS IN RUMEN LIQUOR. F. G. Youssef and D. M. Allen (Dept. of Agr., Univ. of Reading, Berks., England). *J. Sci. Food Agr.* 19, 188 (1968). A method is described for the rapid separation of steam-volatile fatty acids in rumen liquor by

gas-liquid chromatography and automatic titration of the eluted acids. The method consists of a pressure program for nitrogen gas which allows the separation of acids up to *n*-valeric in 22 minutes.

A REFRACTOMETRIC METHOD FOR THE ESTIMATION OF FAT IN COOKIES AND BAKERY PRODUCTS. L. Courlios-Salvi and D. G. Weeden (Arnott's Biscuits Pty. Ltd., Homebush, N.S.W., Australia). *Chem. Ind. (London)* 1967(4), 544-5. A refractometric method for estimating unbound lipid in bakery products is described. The method yields results substantially identical to those obtained by direct light petroleum extraction and is suitable for quality control and possibly for applied research purposes. The data also illustrate the ability of cookie-type dough to bind lipids.

CHANGES IN LEAF PROTEIN LIPIDS IN VITRO. F. H. Shah (Pakistan Council of Sci. and Indust. Res., Lahore, Pakistan). *J. Sci. Food Agr.* 19, 199-202 (1968). Lipids were shown to be responsible for the development of rancidity in leaf protein concentrates from wheat, kale, maize and red clover on prolonged exposure to air, with phospholipids oxidizing more rapidly than neutral fats. The enzyme system causing changes in the protein concentrate was inactivated by heating in nitrogen at 100C, but non-enzymic oxidation of the lipids continued. Addition of ascorbic acid failed to prevent oxidation, but dried 'amla' (*Emblica officinalis*) fruit reduced oxidation considerably and 'jantar' (*Sesbania aegyptica*) to a lesser extent.

CHANGES IN FRYING FATS WITH DIFFERENT FOODS. M. Bennion and R. L. Park (Brigham Young Univ., Provo, Utah). *J. Am. Dietetic Assoc.* 52, 308-12 (1968). The effect of various ingredients in a fritter-type batter on changes in color, viscosity, and free fatty acid content of a corn oil and a hydrogenated vegetable shortening used for approx. 8 hrs. of frying was studied. The production of non-urea-adduct-forming (NUAF) substances, as a measure of polymerization, and of carbonyl-containing compounds, as an indication of oxidation, was also determined. An increase in FFA content and a marked darkening of color after 8 hr. frying were associated with the presence of egg yolk in the batter. The percentage of NUAF esters was relatively low in all fats and was significantly decreased by the presence of egg yolk and baking powder in the batter. Frying for 8 hrs. produced small but not significant increases in viscosity and in carbonyl values. Diffusion of phospholipids from the egg yolk into the frying fat was suggested as an important factor in darkening and in an increased production of free fatty acids.

ALKALINE ISOMERIZATION OF LINOLENIC ACID, I. SEPARATION AND IDENTIFICATION OF THE REACTION PRODUCTS. A. Strocchi (Univ. of Bologna, Bologna, Italy). *Riv. Ital. Sostanze Grasse* 45, 692-8 (1968). By treatment of 9-*cis*,12-*cis*,15-*cis*-octadecatrienoic acid with KOH in ethylene glycol at 180C for 20 minutes, the following compounds are formed: 23.6% octadecatrienoic acids with three conjugated double bonds (2.3% *trans,trans,trans*; 15.3% *di-trans*, mono-*cis*; 5.5% *di-cis*, mono-*trans*); 11.1% 9-(2'-*n*-propyl-cyclohexa-3:5-dienyl)-nonanoic acid; 2.8% of octadecatrienoic acid having two *cis-trans* conjugated double bonds and a *trans*-isolated double bond; 52.7% of octadecatrienoic acids having two *cis-trans* conjugated double bonds and a *cis*-isolated double bond; and 3.2% of octadecatrienoic acids having three isolated double bonds (unreacted products). The above mentioned compounds were separated by TLC on silica gel G-AgNO<sub>3</sub> and identified by GLC, IR and UV.

COMPARISON BETWEEN THE MECHANISMS OF ALKALINE ISOMERIZATION AND AUTOXIDATION OF C<sub>18</sub> POLYUNSATURATED FATTY ACIDS. A. Strocchi and P. Capella (Inst. di Industrie Agrarie, Univ. de Bologna 40126, Italy). *Rev. Franc. Corps Gras* 16, 3-13 (1969). Linoleic and linolenic acids were subjected to alkaline isomerization (KOH in ethylene glycol), and the products formed were analyzed by GLC. In a 1,4-pentadiene system, the action of alkali and heat causes displacement of the double bonds toward the 1,3 and 2,4 positions. Alkaline isomerization of 9-*cis*,12-*cis*-octadecadienoic acid gives rise to *cis-trans* conjugated acids. On the other hand, 9-*cis*,12-*cis*,15-*cis*-octadecatrienoic acid gives rise, during different phases of the reaction, to acids with *cis-trans* conjugated double bonds and an isolated *cis* double bond, to *trans-trans-cis* conjugated double

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bonds, and to cyclic acids, consisting mainly of 9-(2'-n-propylcyclohexa-3,5-dienyl)nonanoic acid. The geometrical configuration of the conjugated double bonds in the products depends on the structure of the intermediary carbanion formed from the original molecule. Experimental results show that the mechanisms for the formation of conjugated double bonds during alkaline isomerization of linoleic and linolenic acids also apply to autoxidation of these same acids.

PHYSICAL NEUTRALIZATION OF FATS AND OILS BY DISTILLATION OF THE FREE FATTY ACIDS AS A MODERN AND ECONOMICAL REFINING METHOD. G. Dell'Acqua and G. Perozzi (Technical Bureau, Maison F. Ili Gianazza SpA., Legnano, Milan, Italy). *Rev. Franc. Corps Gras* 16, 37-47 (1969). The theoretical basis for neutralization by distillation is first reviewed. Next, processing factors are considered, such as pretreatment of the oil, elimination of oxygen, heating methods, low pressure conditions required, and final cooling and saturation of the oil with nitrogen. Finally, the design, construction, and operation of the Physitron plant is discussed. This plant operates satisfactorily on palm oil, peanut oil, ghee oil, tallow and lard with more than 2% free fatty acids. It is possible to use the Physitron plant in a refining complex either as a continuous deodorizer or a neutralizer-deodorizer, depending on whether refining is carried out by the standard method or the physical method.

IDENTIFICATION AND QUANTITATIVE ANALYSIS OF THE PIGMENTS IN VEGETABLE OILS. I. LITERATURE REVIEW. J. Srou (Ecole Sup. Appl. Corps Gras, Paris). *Rev. Franc. Corps Gras* 16, 25-36 (1969). The first part of this review covers the chemistry, biochemical importance and chemical reactions of the chlorophyll and carotenoid pigments. The second part deals with previous work done on isolation and fractionation of the pigments. The pigments may be extracted either from the unsaponifiable fraction of vegetable oils or directly from the oils. In the first case, it is necessary to eliminate the sterols and free fatty acids before fractionating by TLC or liquid-liquid extraction. In the second case, the pigments may be separated by countercurrent distribution or liquid-liquid extraction. They are then fractionated by column chromatography or TLC.

A FIVE-POINT SCALE FOR ORGANOLEPTICALLY RATING THE QUALITY OF MARGARINE. J. Slowikowska (Inst. for Fats and Fat Industries, Warsaw, Poland). *Tluszcz Jadalne* 12(4), 186-192 (1968). A five-point scale is proposed for rating margarines instead of the 100-point scale presently used. Experimental evidence indicates that the flavor and odor defects most often encountered are due to: 1) the quality of the oil, 2) alteration of the milk fermentation, and 3) the quality of the lecithin. Evaluation of the color is affected by three characteristics: 1) shade, 2) intensity and 3) equalization. These characteristics are evaluated by comparison with color standards. The three levels of quality established are very good (5 points), satisfactory (3 points), and bad (1 point). Similar levels of quality are used for consistency, which is evaluated in terms of three characteristics: 1) ability to melt in the mouth, 2) homogeneity, and 3) spreadability at ambient temperature. The relation of the subjective evaluation of odor, flavor, color, and consistency to the five-point scale is as follows: very desirable (5 points), desirable (4 points), satisfactory (3 points), undesirable (2 points), and very undesirable (1 point). Color and consistency are rated only as 5, 3, or 1. Flavor characteristics are rated as follows: for the oil, bland (5-4 points), barely perceptible (3 points), clearly perceptible (2 points), strong and repulsive (1 point); for the lecithin, no aftertaste (5-4 points), aftertaste barely perceptible (3 points), aftertaste clearly perceptible (2-1 points); for the milk, typical odor of the proper intensity (5 points), typical odor, but too strong (4-3 points), non-typical odor clearly perceptible (2-1 points). (Rev. Franc. Corps Gras)

KINETICS OF OIL HYDROGENATION. PART II. I. L. Melamud *et al.* *Izv. Vysshikh Uchebn. Zavedenii, Pischevaya Tekhnol.* 5(66), 37-40 (1968). The rate constant of the total process is a function of the fatty acid composition of the glycerides and of the hydrogenation selectivity. (Rev. Franc. Corps Gras)

THE EFFECT OF FILTRATION ON THE IRON AND TOCOPHEROL CONTENT OF SUNFLOWER SEED OIL. A. Popov *et al.* *Mashlozhir. Prom.* 4(4), 5-9 (1968). Filtration of sunflower seed oil reduces the iron content by 10-50%. The stability of the filtered oil is improved in most cases. Occasionally, a decrease in stability after filtration is observed. This decrease does not

depend on the retention of tocopherols in the residue because the tocopherol content is reduced only by 5-8%. (Rev. Franc. Corps Gras)

MILK LIPIDS. III. FATTY ACIDS OF THE INDIVIDUAL LIPIDS OF THE FAT GLOBULE MEMBRANES IN COW'S MILK. J. Hladik *et al.* *Sb. Vys. Sk. Chem.-Technol. Praze, Potraviny.* E21, 33-40 (1968). GLC of the methyl esters of the fatty acids in the fractions obtained by column chromatography showed a considerable amount of both linear- and branched-chain saturated acids, even and odd numbers of carbon atoms, and unsaturated acids with one, two or three double bonds. (Rev. Franc. Corps Gras)

LEAKAGE OF THE AQUEOUS PHASE IN LOCAL MARGARINES. K. Danowski. *Tluszcz Jadalne* 12(4), 147-157 (1968). A method for studying the aqueous phase of margarines has been developed. The method could serve for control purposes. The manufacturing equipment has an important effect on leakage of the aqueous phase. The coarse crystalline structure of the fat phase, which is formed by working in the Votator, contributes to the formation of a coarse aqueous emulsion. (Rev. Franc. Corps Gras)

OIL CONTENT OF THE PRESSCAKE AS A FUNCTION OF THE YIELD OF THE EXTRACTION EQUIPMENT. A. Ja. Nazarov. *Izv. Vysshikh Uchebn. Zavedenii, Pischevaya Tekhnol.* 5(66), 7-9 (1968). When increasing the yield (Q) of the extraction equipment and the coefficient of total power utilization ( $K_{tot}$ ), it is possible to lower further the oil content of the presscake (H). There exists an inverse correlation between the two. Results of the correlative analysis between H<sub>t</sub> and Q show it to be certain up to 120% of the theoretical norm existing for the yield of the ND-1000 and ND-1250 extractors. (Rev. Franc. Corps Gras)

NEW SOURCES OF OILS. I. CHEMICAL CHARACTERISTICS OF THE TROPICAL SEDGE (*Cyperus esculentus*). P. Petrov *et al.* *Mashlozhir. Prom.* 4(4), 11-19 (1968). A systematic study of the oil of the tropical sedge (or chufa) has been carried out. The fatty acid composition is: palmitic 14.1%, stearic 2.2%, oleic 69.0%, linoleic 13.2% and arachidic 0.8%. The oil is suitable for hydrogenation. (Rev. Franc. Corps Gras)

CHANGES IN THE LIPIDS OF SUNFLOWER SEEDS DURING THERMAL DRYING. V. G. Scerbakov *et al.* *Izv. Vysshikh Uchebn. Zavedenii, Pischevaya Tekhnol.* 5(66), 34-36 (1968). As the drying time of freshly harvested sunflower seeds and the drying temperature is increased, the amounts of phospholipids and triglycerides in the oil increase, while the amounts of free fatty acids and diglycerides decrease. The change in fatty acid composition in the seeds during thermal treatment is analogous to the changes during the latter stages of maturation of the seeds under field conditions: the quantity of low-molecular weight fatty acids decreases as does the quantity of stearic and oleic acids, while the quantity of linoleic acid increases. (Rev. Franc. Corps Gras)

OXIDATIONS IN THE LIQUID PHASE BY MOLECULAR OXYGEN. I. Serée de Roch (French Petroleum Inst., Refining Chem. Branch, Div. of Basic Chem. Res.). *Belg. Chem. Ind.* 33, 994-1006 (1968). In this review, reactions are discussed involving combination of organic compounds with molecular oxygen at temperatures of 0-200C and partial pressures of oxygen of 1-700 psi, hydroperoxidation, polyperoxidation, epoxidation and catalytic oxidation. The types of products resulting from the chain reaction mechanism, and the kinetic considerations, including rate constants, involved in these reactions are covered in detail. Although the discussion is directed toward industrial applications of these reactions, the same considerations also apply to autoxidation of lipids. (Rev. Franc. Corps Gras)

PRELIMINARY EVALUATION OF THE THEORY OF THE FLUIDIZED PIPE FOR COOLING EXTRACTED RAPESEED PRESSCAKE. M. Kubicki. *Tluszcz Jadalne* 12(4), 175-182 (1968). The article contains a description of an experimental installation for cooling extracted rapeseed presscake. The equipment consists of a fluidized pipe 5.3 m long, 0.3 m diameter, with a flow rate of 3660 kg/hr. The results permitted determination of the most important parameters characterizing the process of cooling and conveying extracted rapeseed presscake. The moisture content of the presscake before cooling should be 10-14%. (Rev. Franc. Corps Gras)

ORGANIC SULFUR COMPOUNDS IN THE DISTILLATE FROM COTTON-SEED MISCELLA. S. S. Zufarov *et al.* *Izv. Vysshikh Uchebn.*

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*Zavedeni, Pishchevaya Tekhnol.* 5(66), 41-43 (1968). During distillation of the miscella, the sulfur in CS<sub>2</sub> is the one which undergoes the most important change. The sulfur in disulfide compounds undergoes the least change, and the amount of thiophenic sulfur remains nearly unchanged. At the same time, the amount of hydrogen sulfide increases considerably. During alkaline refining of the miscella, the quantity of organic sulfur compounds decreases by 30% more than during distillation. (Rev. Franc. Corps Gras)

**CORROSION OF ALLOYED STEELS IN CONTACT WITH FATTY ACIDS UNDER HYDROGENATION CONDITIONS.** J. Cechnicki. *Pluszce i Srodki Piorace* 12(5), 176-178 (1968). Samples of several local steels were tested for corrosion resistance in an oscillating autoclave half-filled with fatty acids from bone for 350 hours at 180-200C under 20 atmospheres pressure of hydrogen. Measurement of the variations in weight of the samples showed only a slight superiority of steel containing 2-3% molybdenum over steel containing less molybdenum. (Rev. Franc. Corps Gras)

**EFFECT OF GAMMA RAYS ON TOCOPHEROLS.** A. Rutkowski and L. Mzyk (Dept. Food Technol., Storage Univ. Agr. Olsztyn). *Rev. Franc. Corps Gras* 15, 725-727 (1968). Alpha and gamma tocopherol were irradiated in ethanol and in benzene solutions and in crude and refined rapeseed oil. Retention of tocopherol activity was determined. Dosages of 1 Mrad or higher destroyed significant amounts of both tocopherols, whether dissolved in solvents or in vegetable oils. Gamma tocopherol was more resistant than was alpha tocopherol. Greater loss of both tocopherols occurred in ethanol than in benzene due to the radiolysis mechanisms of the solvents. A smaller loss occurred in the refined oil than in the crude oil.

**DETERMINATION OF WATER IN MARGARINE.** R. Guillaumin (Paris Lab., Inst. des Corps Gras). *Rev. Franc. Corps Gras* 15, 737-746 (1968). Currently used quality control procedures for the amount of water in margarine are based on the loss of weight caused by heating the margarine. These methods, although

giving good results, are relatively slow and cannot be run automatically. The author reviews twelve physical and chemical methods for determining water, considering them in terms of accuracy and possibility for automation. Methods which offer some promise include absorption or reflectance at 1-2 μ, a colorimetric determination in the presence of cobalt salts, conductivity, and NMR.

**OXIDIZED ACIDS IN CRUDE FATS AND OILS. I. PREPARATION OF THE TOTAL OXIDIZED ACIDS AND METHYL ESTERS WITHOUT STRUCTURAL ALTERATION.** M. Naudet and J. Graille (Lab. National des Matieres grasses, ITERG, Fac. des Sciences, Marseille). *Rev. Franc. Corps Gras* 15, 729-735 (1968). Enzymatic hydrolysis of the fat at pH 4.7 and 30C with castor bean lipase yields fatty acids containing, unaltered, the total oxidized acids originally present. An alternative procedure involves neutralization under mild conditions followed by alkaline methanolysis of the glyceride fraction. The resulting methyl esters contain oxidized esters which are representative of the total oxidized acids in the crude oil.

**DEODORIZATION OF FATS AND OILS AS PRACTICED IN RUSSIA.** B. Solomon (Service Documentation ITERG, Paris). *Rev. Franc. Corps Gras* 15, 747-756 (1968). This review discusses the theoretical aspects of oil deodorization and how it is practiced in Russia. The processes described include the SLET continuous deodorizer, use of a four-stage vapor ejector, use of citric acid, deodorization in a layer of foam, and use of an inert gas in operating the DeSmet deodorizing plant.

**SURFACE TENSION AND ADSORPTION IN SOLUTIONS OF FATTY ACIDS AND THEIR ESTERS IN VISCOFLUID OLIGOMERS.** V. A. Sazonov, V. M. Zatkovetskii and P. P. Pugachevich. *Colloid J. U.S.S.R.* 28, 699-702 (1966). The effects of temperature on surface tension, limiting surface activity and adsorption of solutions of fatty acids and castor oil in diethylene glycol adipate polyester (DGAP), and on the surface tension of pure DGAP and pure castor oil, have been studied. The surface layer of the pure polymeric solvent does not create any special conditions

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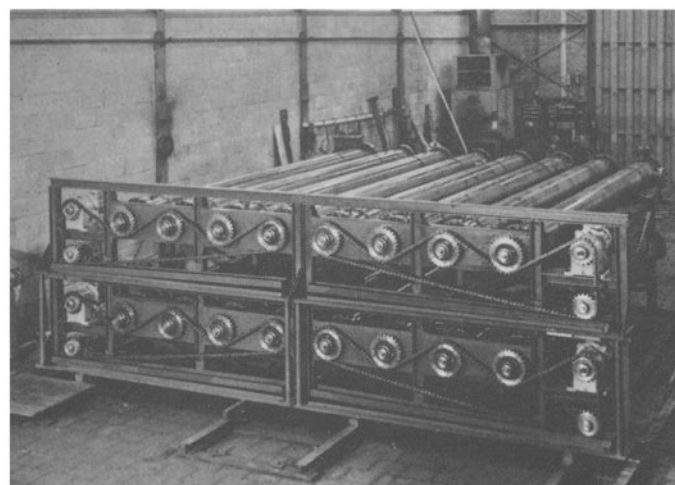
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for adsorption of surface-active substances. The relationships in variations of the surface tension, surface activity and adsorption found for polymeric solutions do not differ from those applying to solutions of other classes, such as metallic and semi-conductor solutions, salt melts, organic mixtures, etc. It is suggested that the observed common nature of the surface phenomena in solutions with different types of molecular interaction would make it possible to predict variations of the volume properties of polymeric solutions, both in the liquid and in the solid phase, from the results of studies of their surface tension. (World Surface Coat. Abs. No. 320)

**SEMIMICRO DETERMINATION OF SAPONIFICATION EQUIVALENT OF HIGHER FATTY ACID ESTERS.** R. D. Tiwari and J. P. Sharma. *Proc. Nat. Acad. Sci. India* 35A, 445-7 (1965). A simple, rapid and accurate semimicro method is described for the determination of saponification equivalents of higher fatty acid esters. A 20-30 mg. sample was accurately weighed in a Pyrex glass vial and transferred to a flask which had an arrangement for passing  $N_2$  gas. An excess of ethanolic KOH (10 ml. of 0.02  $N$ ) was added and heated for  $\frac{1}{2}$  hr under reflux, passing  $N_2$  all the time through the flask. After  $\frac{1}{2}$  hr the contents were cooled and the excess alkali back-titrated against standard solution of methanolic HCl using 3-4 drops of mixed indicator (a mixture of 0.4% methanolic solution of phenol red, cresol red and bromothymol blue in the ratio of 3:1:1). A blank determination was simultaneously carried out under identical conditions. Determinations carried out with the esters of lauric, myristic and palmitic acids showed that the results were accurate to within  $\pm 1\%$  of the theoretical values. (World Surface Coat. Abs. No. 320)

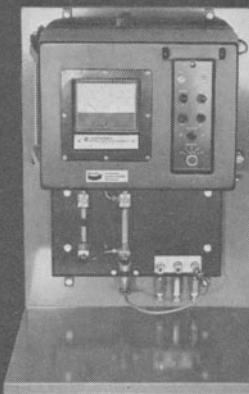
**LOW-FREQUENCY INFRARED SPECTRA OF ALIPHATIC MONOCARBOXYLIC ACIDS.** J. E. Saunders, F. F. Bentley and J. E. Katon. *Appl. Spectroscopy* 22, 286-94 (1968). The I.R. spectra of a number of aliphatic monocarboxylic acids in the 350-50  $cm^{-1}$  range are reported and several consistencies in band frequencies noted. An attempt to assign the low-frequency vibrational modes of some of the simpler acids has been made based on I.R. and Raman intensities. It is concluded that these molecules consist of relatively strongly coupled dimer molecules in the pure liquid and that the spectra reflect this dimer structure. (World Surface Coat. Abs. No. 320)

**DETERMINATION OF NICKEL (II) BY QUENCHING OF THE FLUORESCENCE OF ALUMINUM-1-(2-PYRIDYLAZO)-2-NAPHTHOL AND DIRECT FLUOROMETRIC DETERMINATION OF COBALT.** G. H. Schenk, K. P. Dilloway and J. S. Coulter (Dept. of Chem., Wayne State Univ., Detroit, Mich. 48202). *Anal. Chem.* 41, 510-14 (1969). After a general investigation of the reported fluorescence colors of various metal-PAN (1-(2-pyridylazo)-2-naphthol) complexes, it was found that the nickel(II)-PAN did not fluoresce and that nickel(II) could be determined in the  $10^{-9}$  to  $10^{-7}M$  range by the fluorescence quenching of the aluminum(III)-PAN complex in absolute ethanol. Measurements can be made after a 40-minute heating period or after four hours at room temperature. This method is far more sensitive for traces of nickel(II) than atomic absorption spectrometry or the present colorimetric methods, and has few serious interferences. The same general investigation led to the discovery that a fluorescent species develops when cobalt(II) air oxidizes in the presence of PAN dissolved in 95% ethanol. This oxidation occurs more rapidly in absolute ethanol, and a direct fluorescence method of determination was developed in both solvents.

**INTERACTION BETWEEN LECITHINS AND CHOLESTEROL AT THE AIR-WATER AND OIL-WATER INTERFACES.** R. A. Demel and P. Joos (Lab. of Org. Chem., State Univ. of Utrecht, The Netherlands, and Lab. of Phys. Biochem., State Univ. of Ghent, Belgium). *Chem. Phys. Lipids* 2, 35-46 (1968). Spread mixed monolayers at the air-water interface of cholesterol and phospholipids (dipalmitoyl lecithin and stearoyl-oleoyl lecithin) were investigated using the Goodrich method. It was found that a weak interaction occurred between cholesterol and dipalmitoyl lecithin, on the contrary a large interaction was observed for the system cholesterol, stearoyl-oleoyl lecithin. Recently a theory was developed concerning the ideal behaviour of mixed absorbed films. Since at the oil-water interface mixed absorbed monolayers of cholesterol and the above mentioned phospholipids show an ideal behaviour, the conclusion was drawn that the interaction at the air-water interface is mainly due to Van der Waals-London forces.

**STUDY OF UNSAPONIFIABLE ALCOHOLS. 3. APPLICATION TO THE**

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**ANALYSIS OF FAT MIXTURES.** A. Karleskind (Lab. WOLFF, Paris). *Rev. Franc. Corps Gras* 16, 15-24 (1969). In two previous papers, the author reported on studies of the aliphatic and triterpenic alcohols in the unsaponifiable components of vegetable oils and animal fats. This information has been applied to the determination of the components in a mixture of fats, as an adjunct to fatty acid analysis. Lauric oils may be identified by their short-chain fatty acid content. Other vegetable oils are identified by the composition of the sterols and triterpenic alcohols. Animal fats can be detected by the cholesterol content and identified by the composition of the aliphatic alcohols. Although qualitative identification of the components of simple mixtures can be made, only approximate quantitative results are possible because of large natural variations in these components.

**NONAQUEOUS BEEF FLAVOR COMPONENTS. COMPOSITION OF PETROLEUM ETHER-EXTRACTABLE INTRAMUSCULAR POLAR LIPIDS.** A. F. Mabrouk, E. M. O'Connor, and J. K. Jarboe (Food Lab., U.S. Army Natick Lab., Natick, Mass. 07160). *J. Agr. Food Chem.* 17, 10-14 (1969). Petroleum ether-extractable intramuscular lipids were separated by silica gel chromatography into polar and neutral lipids. Polar lipids were fractionated on an anion exchange DEAE-cellulose column into at least 11 components. Thin-layer chromatography  $R_f$  values, staining behavior with specific reagents, and infrared spectra of intact lipids enabled the identification of seven polar lipids. Six of these were positively identified as phosphatidylcholine, lysophosphatidylcholine, phosphatidylethanolamine, phosphatidylserine, sphingomyelin and phosphatidylinositol; the seventh compound was tentatively identified as sulfatide.

**POLYMORPHISM IN MONOMOLECULAR TRIGLYCERIDE FILMS ON WATER AND FORMATION OF MULTIMOLECULAR FILMS.** T. Bursht, K. Larsson and M. Lundquist (Dept. of Med. Biochem., Univ. of Goteborg, Goteborg, Sweden). *Chem. Phys. Lipids* 2, 102-13 (1968). The behavior of monomolecular films of triglycerides on water has been reinvestigated, and complete phase diagrams were derived. In conflict with earlier reports four different forms of coherent triglyceride monolayers were found. Three are solid and one is an expanded liquid. Although the cross-

(Continued on page 322A)

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sectional areas and transition points of the condensed phases of the monolayer are very similar to values observed for polymorphic forms of the three-dimensional state, the molecular conformations are fundamentally different. This illustrated the dominating effect of the hydrocarbon chain packing on the physical properties, and the danger in relating structure in monomolecular films of complex lipids to three-dimensional states on the basis of agreement between transition points and molecular cross-section areas only. When monolayers are compressed beyond the collapse points, the pressure remains stable until an area is reached which corresponds to a triple chain-length film. It is proposed that two types of molecular conformations occur in triglyceride multilayers on water, with the same conformation in the upper layers as in the crystalline state.

IDENTIFICATION OF A VOLATILE COMPONENT IN SOYBEANS THAT CONTRIBUTES TO THE RAW BEAN FLAVOR. L. R. Mattick and D. B. Hand (Dept. of Food Sci. and Tech., N.Y. State Agr. Exp. Station, Cornell Univ., Geneva, N.Y. 14456). *J. Agr. Food Chem.* 17, 15-17 (1969). A volatile component which develops in soybeans and contributes to the raw bean odor and flavor has been isolated and identified as ethyl vinyl ketone by gas chromatography and mass spectrometry. The green bean odor and flavor have been attributed to this compound. This component was isolated by distillation at 40C into cold traps of dry ice and ethanol or liquid nitrogen.

THERMAL DEGRADATION OF LIPIDS. W. W. Nawar (Dept. of Food Sci. and Tech., Univ. of Mass., Amherst, Mass. 01003). *J. Agr. Food Chem.* 17, 18-21 (1969). Thermally induced reactions occurring in lipids under nonoxidative conditions are reviewed. Free fatty acids may be formed in both the absence and presence of moisture. In thermal hydrolysis of triglycerides, there is a preferential release of the shorter-chain and the unsaturated fatty acids, but no positional specificity is observed. The mechanisms of formation of lactones, methyl ketones, hydrocarbons, and monocarboxylic and dicarboxylic methyl esters in heated fats are discussed.

STERIODS CONTAINING RING A AROMATIC. XIV. THE RUTHENIUM TETROXIDE OXIDATION OF AROMATIC STEROIDS. D. M. Piatak, G. Herbst, J. Wicha, and E. Caspi (Worcester Found. for Exp. Biology, Shrewsbury, Mass. 01545). *J. Organic Chem.* 34, 116-20 (1969). The use of ruthenium tetroxide for degrading aromatic steroids has been explored. An interesting double allylic oxidation of ring A phenols has been observed with this reagent.

OXIDATION OF STEROIDAL KETONES. VII. CLEAVAGE OF STEROIDAL CONJUGATED KETONES WITH RUTHENIUM TETROXIDE. D. M. Piatak, H. B. Bhat and E. Caspi (Worcester Found. for Exp. Biology, Shrewsbury, Mass. 01545). *J. Organic Chem.* 34, 112-16 (1969). Ruthenium tetroxide has been utilized for the cleavage of conjugated and cross-conjugated steroidal ketones. In some instances the yields have been superior to those found for ozone. The unexpected formation of enediones has been observed in the oxidation of 1,4-diene-3,11 diones.

REASSIGNMENT OF CONFIGURATION TO THE 22-HYDROXYCHOLESTEROLS. SYNTHESIS OF (22S)- AND (22R)-<sup>3</sup>H-CHOLESTEROLS. E. P. Burrows, G. M. Hornby and E. Caspi (Worcester Found. for Exp. Biology, Shrewsbury, Mass. 01545). *J. Organic Chem.*

34, 103-7 (1969). Stereospecifically labeled (22S)- and (22R)-<sup>3</sup>H-cholesterols were synthesized via (22S)-hydroxy-22-<sup>3</sup>H- and (22R)-hydroxy-22-<sup>3</sup>H-cholesteryl 3-benzoates, respectively. The (22S)- and (22R)-hydroxycholesterols, the (22S)- and (22R)-hydroxycholesteryl 3-benzoates and the (22S)- and (22R)-hydroxycholesteryl 3-methyl ethers were interrelated. Assignments of configuration at C-22 were made on the basis of the Horeau and Prelog procedures; the two methods lead to identical assignments. Results demonstrate that the configurations assigned previously to the 22-hydroxycholesterols and their derivatives are incorrect and should be reversed.

BAKER'S ALL-PURPOSE, PLASTIC SHORTENING COMPOSITION. K. W. Nelson (The Procter & Gamble Co.). *U.S. 3,429,714*. A baker's all-purpose, plastic shortening useful for the preparation of high volume cakes and stable cream icings comprises a shortening base and a combination of three additives in certain amounts and proportions. The three additives are: monoester of glycerol and fatty acid, monoester of propylene glycol and fatty acid and monoester of polyoxyethylene sorbitan and fatty acid.

METHOD FOR PRODUCING A SOLVENT FOR EDIBLE OILS. K. D. Utti (Universal Oil Products Co.). *U.S. 3,429,802*. A method for producing an edible oil solvent involves subjecting a pretreated non-aromatic raffinate stream from a solvent extraction zone with hydrogen to produce a non-aromatic C<sub>6</sub>-C<sub>9</sub> hydrocarbon product containing less than 1% aromatic hydrocarbons. The hydrotreated non-aromatic product is uniquely suitable for use as an edible oil solvent.

ROLLING OILS. H. J. Drake (Bethlehem Steel Corp.). *U.S. 3,429,815*. A method used in the rolling of light gage steel strip comprises applying to the strip at a point prior to the work rolls an aqueous dispersion of 5-30% of an oil mixture containing 40-80% of a mineral oil having viscosity of 35-75 SSU at 100F and 60-20% of a member of the group consisting of (a) a fatty acid, predominantly C<sub>18</sub>-C<sub>18</sub>, (b) a fatty oil in which a major portion of the total free and combined fatty acid content has a C<sub>16</sub>-C<sub>18</sub> chain length and which includes at least 7% free fatty acids, and (c) mixtures of the above.

ON THE STRUCTURE OF LIPOAMINO ACIDS. J. G. Molotkovsky and L. D. Bergelson (Inst. of Chem. of Natural Products, USSR Academy of Sciences, Moscow). *Chem. Phys. Lipids* 2, 1-10 (1968). Syntheses of 1-((1',2'-distearoyl-glyceryl)-phosphoryl)-3-L-lysyl-glycerol (XII) and 1-((1',2'-distearoyl-glyceryl)-phosphoryl)-2-L-lysyl-glycerol (XXII), as well as of 1-L-lysyl-3-((1',2'-distearoyl-glyceryl)-phosphoryl)-glycerol (XVI) are described, the first two substances having the same configuration at all asymmetric atoms as the natural lysyl ester of phosphatidyl glycerol. It was shown that the  $\alpha$ - and  $\beta$ -lysyl- $\gamma$ -phosphatidyl-glycerols differ in their melting points and chromatographic properties and that they do not undergo interconversion on silica gel chromatography in acid or neutral systems. Since synthetic 1-((1'-oleoyl-2'-palmitoyl-glyceryl)-phosphoryl)-3-L-lysyl-glycerol was shown to be chromatographically indistinguishable from the natural lipoamino acid, the native compound must be the  $\alpha$ -isomer.

**• Biochemistry and Nutrition**

PROSTAGLANDIN STIMULATION OF RAT CORTICOSTEROIDOGENESIS. J. D. Flack, R. Jessup and P. W. Ramwell (Worster Found. for Exptl. Biology, Shrewsbury, Mass.). *Science* 163, 691-2 (1969). Prostaglandins and their C20: $\omega$ 6 fatty acid precursors are present in rat adrenal glands. Small doses of prostaglandins (PGE<sub>1</sub>, PGE<sub>2</sub>, or PGF<sub>1 $\alpha$</sub> , 1.4 to 2.4 micromolar) increased steroidogenesis in the superfused adrenal glands obtained from hypophysectomized rats. This effect was mimicked in part by both adrenocorticotropin and its postulated intracellular intermediate adenosine 3',5'-cyclic monophosphate; all three responses were inhibited by cycloheximide.

PROSTAGLANDINS: ENZYMATIC ANALYSIS. E. Ånggård, F. M. Matschinsky and B. Samuelsson (Dept. of Pharmacology, Karolinska Inst., Stockholm, Sweden). *Science* 163, 479-80 (1969). By means of a specific nicotinamide-adenine dinucleotide-dependent prostaglandin dehydrogenase from swine lung, an enzymatic method has been developed for the assay of prostaglandins. The method permits analysis with a lower limit of 10<sup>-12</sup> mole of prostaglandin.

CARDIAC GANGLIOSIDES IN SPHINGOLIPIDOSES. L. Schneck, W. Kleinberg and B. W. Volk (Dept. of Pediatrics and Isaac

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Albert Res. Inst. of the Kingsbrook Jewish Med. Center, Brooklyn, N.Y. 11203). *Proc. Soc. Exp. Biol. Med.* 130, 404-6 (1969). The finding of ganglioside in heart is further evidence of the widespread distribution of these lipids. The increase of GM<sub>2</sub> (G<sub>6</sub>) ganglioside in the heart of two patients with GM<sub>2</sub> gangliosidosis suggests that the metabolic defect is not limited to the nervous system.

**METABOLIC ASPECTS OF 4-AMINOPYRAZOLOPYRIMIDINE-INDUCED FATTY LIVER IN THE RAT.** P. Puddu, V. Ottani, P. Zanetti and M. Marchetti (Inst. di Chimica Biologica e di Biochimica Applicata dell'Università di Bologna, Bologna, Italy). *Proc. Soc. Exp. Biol. Med.* 130, 493-6 (1969). The effect of the adenine analogue, 4-aminopyrazolo pyrimidine (APP), on liver lipid composition, on liver content of ATP, on lipogenesis *in vitro* in liver slices and on serum lipoproteins in the rat is reported. The effect of ATP and of adenine in APP-treated rats is also presented. The neutral fats in the liver of APP-treated rats increased significantly, while the incorporation *in vitro* of acetate-<sup>14</sup>C into total lipids decreased when compared with the controls. Under the same experimental conditions the concentration of serum lipoproteins fell and the liver content of ATP increased. The administration of ATP to APP-treated rats did not prevent the development of fatty liver, the decrease of serum lipoprotein concentration, or the fall in incorporation of acetate-<sup>14</sup>C into liver lipids. The administration of adenine to APP-treated rats partially reversed the effects of APP on the lipid content of liver, on the levels of serum lipoproteins and on the incorporation of acetate into lipids.

**MANIPULATION OF THE RUMINAL FERMENTATION. I. EFFECT OF SODIUM SULFITE ON BOVINE RUMINAL FATTY ACID CONCENTRATION AND MILK COMPOSITION.** W. S. Alhassan, L. F. Krabill and L. D. Satter (Dept. of Dairy Sci., Univ. of Wis., Madison). *J. Dairy Sci.* 52, 376-79 (1969). An attempt was made to manipulate the ruminal fermentation by using sodium sulfite to partially inhibit the production of ruminal acetate. Six lactating cows were divided into experimental and control groups, with the experimental group receiving 160 g of sodium sulfite in their daily ration. Sodium sulfite significantly ( $P < 0.01$ ) reduced the molar percentage of ruminal acetate from 65 to 55%. The molar per cent of propionate was increased from 18 to 23.7% ( $P < 0.01$ ). Ruminal butyrate and valerate were also significantly increased by sulfite feeding. Per cent milk fat, solids-not-fat, milk protein, and total milk production were not affected by sulfite feeding. Feed intake was not impaired by including sulfite in the ration, although preliminary studies suggested that the palatability could be reduced. No toxic effects of sulfite were observed at a daily intake of 160 g per day.

**NATURALLY OCCURRING ATHEROSCLEROSIS IN TURKEYS.** C. C. Middleton (Dept. of Lab. Animal Med., Bowman Gray School of Med., Wake Forest Univ., Winston-Salem, N.C.). *Proc. Soc. Exp. Biol. Med.* 130, 638-642 (1969). Coronary artery and aortic atherosclerosis was studied in the Broad Breasted Bronze and Beltsville White breeds of turkeys from 1 day of age through 24 weeks of age. Serum cholesterol levels and blood pressures were reported. The usefulness of turkeys as an animal model for the study of atherosclerosis was compared to the White Carneau pigeon and squirrel monkey (*Saimiri sciureus*).

**SOME RELATIONSHIPS BETWEEN PLASMA, LIVER AND EXCRETA TOCOPHEROL IN CHICKS FED GRADED LEVELS OF ALPHATOCOPHERYL ACETATE.** W. J. Pudielkiewicz and Nakiya Mary (Poultry Sci. Dept., Storrs Agr. Exp. Station, Univ. of Connecticut, Storrs, Conn.). *J. Nutr.* 97, 303-306 (1969). Upon feeding d-, or dl- $\alpha$ -tocopheryl acetate to chicks, at graded levels up to 2% of the diet, both plasma and liver tocopherol concentrations plateaued between dietary intakes of 667 and 3,333 mg/kg of diet when the log of the response was plotted against the log of the dietary concentration. Balance studies determined that the percentage of the tocopheryl acetate intake, which was excreted as the ester, increased sharply between the same dietary tocopherol intakes at which the plasma and liver tocopherol concentrations began to plateau. At a dietary tocopherol intake of 2%, approximately 75% of the tocopheryl acetate was excreted as the intact ester. Log plasma tocopherol concentrations, when plotted on log liver tocopherol concentrations, were linear over the entire range of dietary intakes from three experiments.

**EFFECT OF DIETARY AMINO ACID COMPOSITION OF THE ACCUMULATION OF LIPIDS IN THE LIVER OF GROWING RATS.** Y. Aoyama, A. Yoshida and K. Ashida (Lab. of Nutr. Biochem., Dept. of Agr. Chem., Nagoya Univ., Chikusa, Nagoya, Japan).

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*J. Nutr.* 97, 348-52 (1969). In an attempt to clarify the biochemical nature of the variances in the lipid content of liver of rats fed either low egg albumin or low casein diets, the effect of specific diets, consisting of amino acid mixtures which simulated egg albumin and casein and in which the level of S-containing amino acids varied, was examined. The decline in the level of S-containing amino acids (methionine and cystine) in the amino acid mixtures simulating albumin caused a lowering of the liver lipids. Conversely, the high level of S-containing amino acids in the amino acid mixtures simulating casein caused an elevation of the liver lipid content. Consequently, the dietary level of S-containing amino acids was considered to be the major factor governing the accumulation of liver lipids in rats fed the low protein diets. Results indicate also that the ratio of methionine to cystine in the amino acid mixtures does not affect the lipid level in the liver.

**THE BIOCHEMISTRY OF LONG-CHAIN, NONISOPRENOID HYDROCARBONS. I. CHARACTERIZATION OF THE HYDROCARBONS OF *SARCIINA LUTEA* AND THE ISOLATION OF POSSIBLE INTERMEDIATES OF BIOSYNTHESIS.** P. W. Albro and J. C. Dittmer (Dept. of Biochem., St. Louis Univ. Med. School, St. Louis, Mo. 63104). *Biochemistry* 8, 394-404 (1969). The hydrocarbons of an adequately identified strain of *Sarcina lutea* were characterized by a combination of thin-layer and gas-liquid partition chromatography, infrared spectroscopy and oxidative cleavage of the double bonds. The major hydrocarbon fractions had 27, 28 and 29 carbons (18.4, 12.7, and 65.3% of the total, respectively) and the proportions did not vary greatly with the age of the culture. In 48-hr cultures, 90% of the hydrocarbons were monounsaturated and the percentage decreased as the cells continued into stationary phase. Only hydrocarbons with *cis* configuration of the double bond were detected. Chromatographic analysis of the hydrocarbons and the fatty acids produced by oxidation of the double bonds was used to establish the detailed structure of the three major fractions. A large percentage of these had branched methyl groups in either the *iso* or *anteiso* configuration on both ends and the double bonds were near the center of the primary chain. This is consistent with biosynthesis by head-to-head condensation of two fatty acids. Also, because 36% of the fatty acids obtained by oxidation of the double bonds of the hydrocarbons were found to be a C-14 *anteiso* fatty acid which was not found in the lipid fatty acids, decarboxylation of one of the fatty acids during condensation probably occurs. In further support for this biosynthetic mechanism, long-chain ketones and secondary alcohols that would be expected as intermediates in such a pathway were isolated from the non-saponifiable lipids of *S. lutea*.

**THE BIOSYNTHESIS OF UNSATURATED FATTY ACIDS BY BACILLI.** A. H. Fulco (Lab. of Nuclear Med. and Radiation Biol. and Dept. of Biol. Chem., Univ. of Calif., Los Angeles, Calif.

(Continued on page 325A)

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90024). *J. Biol. Chem.* 224, 889-95 (1969). The biosynthesis of unsaturated fatty acids in bacilli has been investigated by studying the way that various species and strains carry out the desaturation of palmitic-1-<sup>14</sup>C acid. By this method, two distinct desaturation systems have been elucidated. One system, found in six different strains, results in the conversion of palmitate to 5-hexadecenoate, with no other double bond isomers appearing. A second system, found in five strains, results in a spectrum of double bond isomers centering around position 9 but including Δ<sup>8</sup> and Δ<sup>10</sup> isomers, sometimes as the major constituents. The rate of desaturation of palmitate is determined by the temperature at which the cultures are incubated with this substrate and not by the temperature of growth.

THE EFFECT OF TOPICAL VITAMIN A ON PAPILLOMAS AND INTRA-EPITHELIAL CARCINOMAS INDUCED IN HAMSTER CHEEK POUCHES WITH 9,10-DEMETHYL-1,2-BENZANTHRAcene. A. Polliack and I. S. Levi (Dept. of Path., Hebrew Univ., Hadassah Med. School, Jerusalem, Israel). *Cancer Res.* 29, 327-32 (1969). Foci of intraepithelial carcinoma and benign papillomas up to 2 mm in diameter were present in the cheek pouches of all 6 hamsters sacrificed immediately after completion of local treatment with 0.5% 9,10-dimethyl-1,2-benzanthracene (DMBA) in paraffin during a period of 6 weeks. Among 6 hamsters treated similarly but sacrificed 2 months after discontinuation of the local application of DMBA, only 3 showed benign papillomas, and no carcinomas were present. The epithelial changes induced with DMBA during 6 weeks thus regressed partially when application of the carcinogen was discontinued. However, subsequent treatment of these lesions with vitamin A induced an increase in size and malignancy. This effect of vitamin A may be related to increased permeability of cellular and subcellular membranes with resulting increased permeation of the carcinogen into cellular structures. However, since the administration of DMBA was discontinued prior to the application of vitamin A, the findings probably resulted from a direct effect of vitamin A on metabolic processes in epithelial cells which had previously been altered by DMBA.

EFFECT OF AN EXTRACT OF UV-IRRADIATED ACID ON AZO DYE CARCINOGENESIS. A. S. Mulay, R. W. O'Gara, H. J. Anderson, L. D. Saslaw and V. S. Waravdekar (Nat. Cancer Inst., Bethesda, Md. 20014). *Cancer Res.* 29, 373-9 (1969). One to four intraperitoneal injections of water extract of UV-irradiated linolenic acid were given to male Osborne-Mendel rats. Injections were at monthly intervals with graded doses (120 to 600 thiobarbituric acid units/kg/dose) of the extract. Some of these rats received a subcarcinogenic dose (0.12%) of *p*-dimethylaminoazobenzene (DAB) in powdered Purina chow diet from the day of first injection for four months. The experiments were terminated two months later. Four hundred units or more of UV-extract alone were lethal within 72 hours, lower dosage of the UV-extract produced chronic toxicity, with swelling of the liver, fusion of its lobes, and adhesions to surrounding structures. DAB in the diet for 4 months and 3 or 4 injections of UV-extract caused extensive cholangiofibrosis of the liver in all the animals and hepatoma nodules in 25% of the rats. Activity of some oxidases, dehydrogenases, and phosphatases of the livers of these rats was 25 to 40% lower than that of the comparable enzymes in control rats.

DIETARY CHOLESTEROL AND SERUM CHOLESTEROL-ESTERIFYING ACTIVITY IN RABBITS. I. C. Wells and E. L. Rongone (Dept. of Biochem., Creighton Univ. School of Med., Omaha, Neb. 68131). *Proc. Soc. Exp. Biol. Med.* 130, 661-4 (1969). The feeding of a normal diet containing 0.7% cholesterol to rabbits results in increased levels of activity of the plasma cholesterol-esterifying enzyme, lecithin: cholesterol fatty acid transferase. The increased level of enzyme activity occurs within one week after the beginning of cholesterol feeding. Associated with the increased levels of enzyme activity are increased concentrations of cholesterol esters in liver, kidney and heart tissue but not in adrenal or skeletal muscle tissue. No sex differences were observed.

CONVERSION OF ACETATE-2-<sup>14</sup>C TO <sup>14</sup>CO<sub>2</sub> AND <sup>14</sup>C-FATTY ACIDS IN THE PARTIALLY HEPATECTOMIZED RAT. E. D. Neville, K. S. Talarico and D. D. Feller (Environmental Bio. Division, Ames Res. Center, NASA, Moffett Field, Calif. 94035). *Proc. Soc. Exp. Biol. Med.* 130, 643-51 (1969). Partially hepatectomized (67%) rats were injected with acetate-2-<sup>14</sup>C at various times postoperative and the expired <sup>14</sup>CO<sub>2</sub> measured for 3 hr. Liver <sup>14</sup>C-nonsaponifiable lipids, <sup>14</sup>C-fatty acids and total fatty acid content were determined. Plasma triglycerides, phospholipids,

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free fatty acids, and <sup>14</sup>C-lipids were determined. The recovery of <sup>14</sup>CO<sub>2</sub> showed no significant difference from sham-operated controls except during the 72-75 hr. postoperative period when an increased excretion was noted. The specific activity of the expired CO<sub>2</sub> of the partially hepatectomized rat was increased as a result of a lower CO<sub>2</sub> production. The lower CO<sub>2</sub> production was attributed to an increased lipid oxidation by the partially hepatectomized rat. The appearance of <sup>14</sup>C as liver fatty acids was comparable to sham-operated and nonoperated control values. The results suggest that, in addition to deposition via transport, the fatty acid content of the regenerating liver is also increased by synthesis *in situ* during the premitotic as well as the mitotic phase.

THE ROLE OF SELENIUM IN THE PLACENTAL TRANSFER OF VITAMIN E IN THE RAT. P. Cheeke, R. Bull and J. Oldfield (Dept. of Animal Sci., Oregon State Univ., Corvallis, Oregon 97331). *Proc. Soc. Exp. Biol. Med.* 130, 172-74 (1969). Transfer of tritium-labeled α-tocopherol across the placental membrane was significantly lower (p < 0.005) in rats receiving dietary selenium supplementation than in a selenium- and vitamin E-deficient group. Approximately equal fetal uptake of radioactivity was observed in groups receiving either supplementary selenium or vitamin E. Whether these differences in transfer of α-tocopherol to the fetuses relate to a sparing effect of selenium for vitamin E in the fetal tissue, or are due to variations in the amount of maternal tissue retention of the administered dose, thus limiting the amount available for fetal uptake, remains to be determined.

SURVIVAL OF GERMFREE RATS WITHOUT VITAMIN A. J. G. Bieri, E. G. McDaniel and W. E. Rogers, Jr. (Lab. of Nutr., Nat. Inst. of Arthritis and Metabolic Diseases, Bethesda, Md. 20014). *Science* 163, 574-5 (1969). Weanling, germfree rats, transferred to a conventional animal room and fed a vitamin A-deficient diet, died in 23 to 54 days. In contrast, their littermates, kept germfree and on the same diet, survived for as long as 272 days. The rats kept in germfree conditions stopped growing after 1 to 4 months but responded to supplements of retinoic acid.

ESSENTIAL FATTY ACID DEFICIENCY AND THE TESTIS: LIPID COMPOSITION AND THE EFFECT OF PREWEANING DIET. J. G. Bieri,  
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K. E. Mason and E. L. Prival (Lab. of Nutr. and Endocrinol., Nat. Inst. of Arthritis, Nat. Inst. of Health, Bethesda, Md.). *J. Nutr.* 97, 163-72 (1969). These experiments were designed to characterize the lipid changes in the rat testis as essential fatty acid (EFA) deficiency progresses and to relate these to the gross and histological state of the tissue. Also, information was sought as to why reports of testis damage in EFA deficiency have been conflicting. It was found that predepletion by feeding an EFA-deficient diet 11 days before weaning resulted in testis damage in 6 to 9 weeks compared with more than 16 weeks in rats fed the diet after weaning. Three percent of saturated fat did not accelerate EFA deficiency compared with a fat-free diet. Analyses of testes for total lipid, total phospholipid, phospholipid classes, total fatty acids and fatty acids in the choline and ethanolamine phosphatides after 6 and 9 weeks of EFA deficiency did not reveal any changes which could be correlated with the onset of histological damage. The testis appears to be particularly sensitive to EFA deficiency during the developmental period, but if maturation occurs, then a prolonged period of deficiency is required before damage appears. The results suggest that secondary effects of EFA deficiency are responsible for eventual testis degeneration.

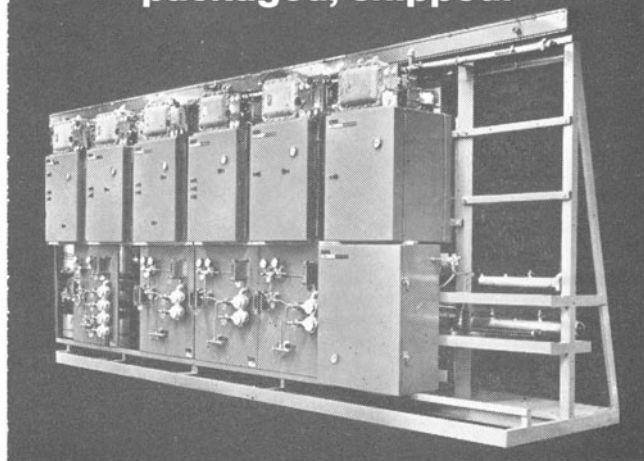
NICOTINE HYDROGEN TARTRATE: EFFECT ON ESSENTIAL FATTY ACID DEFICIENCY IN MATURE PIGS. W. R. Allt, T. R. E. Pilkington and N. Woolf (Dept. of Med., St. George's Hosp. Med. School, London, S.W.1). *Science* 163, 391 (1969). Nicotine (as the acid tartrate) prevented the development of essential fatty acid deficiency symptoms in animals receiving a linoleate-deficient diet.

EFFECT OF DIFFERENT LIPIDS IN RATION OF LACTATING DAIRY COWS ON COMPOSITION OF MILK. H. P. Adams, V. R. Bohman, A. L. Lesperance and J. M. Bryant (Animal Science Div., Max C. Fleischmann College of Agr., Reno, Nevada). *J. Dairy Science* 52, 169-71 (1969). Twelve Holstein cows were assigned to three blocks of a 4x4 Latin-square experimental design. The within-block treatments were: control, 1% Degras wool fat (48.3% cholesterol), 1% mixed soy sterols and a mixture of 0.5% Degras fat, and 0.5% of soy sterols of the concentrate mixture. The concentrates between blocks contained no added fat, 10% animal tallow, or 10% vegetable oil. Milk fat production, fat test, and fat-corrected milk production were highest when no sterol was added to the ration. Percentages solids-non-fat, milk cholesterol, and blood fat were apparently not affected by the different sterols. However, cows had lower blood cholesterol when a mixture of animal and plant sterols was fed compared to other groups. Milk production, milk fat production, fat-corrected milk, blood fat, and blood cholesterol were significantly higher when either tallow or vegetable oil was fed. However, milk fat test was significantly lower. Milk fat production, solids-not-fat, and milk cholesterol were not significantly affected by fat source.

QUALITATIVE ANALYSIS OF THE ISOTHIOCYANATES IN RAPE AND MUSTARD SEEDS. P. Rigolier (Ecole Supérieure d'Application des Corps Gras, Paris). *Rev. Franc. Corps Gras* 15, 683-686 (1968). By gas chromatographic analysis of the isothiocyanates, contamination of rapeseeds with black mustard seeds may be detected. Allylisothiocyanate is found only in the latter seed. The seeds are first milled and the fat is extracted. The thioglucosides in the extracted meal are hydrolyzed with a solution of myrosinase, prepared from white mustard seeds, to yield the isothiocyanates. TLC does not give adequate resolution of the different isothiocyanates whereas GLC does. (2 m column, 10% DEGS on Gas Chrom P, 80/100 mesh silanized, column temp. 90C, injector temp. 130C, flame ionization detector temp. 130C, nitrogen carrier gas pressure 0.8 kg. cm.<sup>2</sup>)

THE USE OF COMPUTERS TO STUDY RATES OF LIPID METABOLISM. N. Baker (Radioisotope Res., Vet. Admin. Center, Los Angeles, Calif. 90073). *J. Lipid Res.* 10, 1-23 (1969). Many complex problems of lipid metabolism are especially suited for multi-compartmental analysis with computers. Examples are presented. The use of a model as a means of communicating one's working hypothesis and the model as it relates to experimental design are discussed. A number of principles relating to experimental design and to the interpretation and presentation of data are illustrated by 12 studies selected from the literature. These include evaluations of turnover and transport rates of liver and plasma triglycerides, triglyceride synthesis, phospholipid synthesis and lipid oxidation to CO<sub>2</sub>. A discussion of computer-oriented vs. noncomputer-oriented techniques is included. Some of the practical problems involved in computer analysis are also considered. Among these are the choice of computer, computer applications, stepwise vs.

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multicompartmental analysis, validity of single-injection type experiments, avoidance of multicompartmental analysis, nonsteady state systems and nomenclature.

MOLECULAR SPECIES OF LECITHINS OF RAT HEART, KIDNEY AND PLASMA. A. Kuksis, W. C. Breckenridge, L. Marai and O. Stachnyk (Banting and Best Dept. of Med. Res. and Dept. of Biochem., Univ. of Toronto, Toronto, Canada). *J. Lipid Res.* 10, 25-32 (1969). The lecithins of the heart, kidney and plasma of the rat were isolated, and the major molecular species identified and quantitatively estimated by combined thin-layer and gas-liquid chromatographic analyses and specific enzymic hydrolyses. The lecithins of the three tissues differed significantly in the composition, positional distribution and pairing of the fatty acids. No preferential pairing of any one saturated with any other unsaturated fatty acids was observed. The three tissues contained qualitatively the same molecular species of lecithins. The lecithin profiles of the rat heart and kidney appeared to be unrelated to that of the plasma.

GAS-LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY CERAMIDES. B. Samuelson and Karin Samuelsson (Dept. of Med. Chem., Royal Veterinary College, Dept. of Neurology, Karolinska Sjukhuset, Stockholm, Sweden). *J. Lipid Res.* 10, 41-46 (1969). Two series of ceramides with either sphingosine (sphing-4-enine) or sphinganine as base and with one of the saturated fatty acids C<sub>16</sub>, C<sub>18</sub>, C<sub>20</sub>, C<sub>22</sub>, C<sub>24</sub>, C<sub>26</sub>, or oleic acid were analyzed as the 1,3-di-O-trimethylsilyl ether derivatives by gas chromatography-mass spectrometry. The fragments formed on electron impact can be divided into three main groups, namely "molecular weight fragments," "long-chain base fragments," and "fatty acid fragments." The m/e values of these fragments can be used to determine unequivocally the structures of the long-chain base and fatty acid of a ceramide derived from a sphingolipid.

LYSOSOMAL PHOSPHOLIPASES A<sub>1</sub> AND A<sub>2</sub> OF BOVINE ADRENAL MEDULLA. A. D. Smith and H. Winkler (Dept. of Pharmacol., Univ. of Oxford, England). *Biochem. J.* 108, 867-73 (1968). Lecithin-<sup>32</sup>P and phosphatidylethanolamine-<sup>32</sup>P were prepared

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by incubating rat liver mince with phosphate-<sup>32</sup>P. With these <sup>32</sup>P-labelled phospholipids conditions for the quantitative assay of phospholipase A activity were established. The distribution of phospholipase A activity between subcellular fractions of the bovine adrenal medulla was determined. Phospholipases A<sub>1</sub> and A<sub>2</sub> with pH optima at 4.2 and 6.5 respectively, were found in the large-granule fraction. By means of sucrose density-gradient centrifugation it was shown that both these phospholipases were localized in lysosomes. Lysosomal phospholipase A<sub>1</sub> catalyzed the hydrolysis of lecithin-<sup>32</sup>P and phosphatidylethanolamine-<sup>32</sup>P at the same rate. The enzymic activity was inhibited by 70% in the presence of 10mM calcium chloride. Lysosomal phospholipase A<sub>2</sub> catalyzed the hydrolysis of phosphatidylethanolamine more rapidly than it hydrolysed lecithin. The hydrolysis of phosphatidylethanolamine, but not that of lecithin, by phospholipase A<sub>2</sub> was activated by 0.8 mM calcium chloride. However, the hydrolysis of both substrates was inhibited by 8 mM calcium chloride. The significance of the presence of phospholipase activity in lysosomes is discussed in relation of the functions of lysosomes in general and in the adrenal medulla.

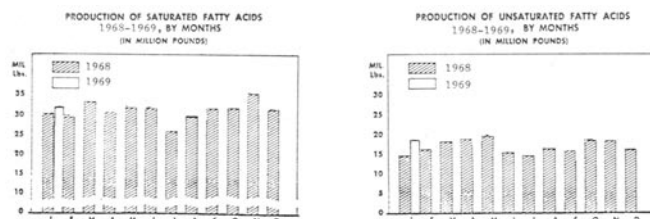
STUDIES ON MEDIUM CHAIN FATTY ACYL COENZYME A SYNTHETASE: PURIFICATION AND PROPERTIES. J. Bar-Tana, G. Rose and B. Shapiro (Dept. of Biochem., Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel). *Biochem. J.* 109, 269-74 (1968). Medium chain fatty acyl CoA synthetase (EC 6.2.1.2) was isolated and the enzyme activity determined by the disappearance of CoA in the presence either of butyrate and ATP or of butyryl-AMP, as well as by ATP formation from butyryl AMP and PP<sub>1</sub>. Preincubation of the enzyme with CoA and ATP alone or together, followed by the removal of these substrates by gel filtration, caused a marked inhibition of ATP formation, contrary to results previously obtained with palmitoyl-CoA synthetase. The effect of ATP on butyryl-AMP-dependent CoA disappearance was inconsistent. Low concentrations of ATP (0.1-0.5mM) always caused inhibition, whereas higher concentrations (5-10mM) activated in some enzyme preparations and inhibited in others. This inconsistency was shown to be due to the presence of two enzyme fractions. Both fractions had similar activities when assayed by the butyryl-AMP- or butyrate-plus-ATP-dependent CoA disappearance. However, fraction I was activated by ATP as measured by butyryl-AMP-dependent CoA disappearance whereas fraction II was inhibited by it. Fraction I also catalysed ATP formation from butyryl-AMP and PP<sub>1</sub> whereas fraction II was lacking in such activity. The relationship of these observations with respect to other known mechanisms of fatty acid-activating systems is discussed.

STUDIES ON MEDIUM-CHAIN FATTY ACYL COENZYME A SYNTHETASE ENZYME FRACTION I: MECHANISM OF REACTION AND ALLOSTERIC PROPERTIES. J. Bar Tana and G. Rose. *Ibid.* 275-82. The mechanism of butyrate activation catalysed by an enzyme fraction derived from ox liver particles was studied by an analysis of the initial-velocity pattern of the overall reaction and found to conform to the Bi Uni Uni Bi Ping Pong model. A homotropic co-operative effect was exerted by CoA on fraction I, whereas ATP and AMP functioned as heterotropic cooperate ligands with respect to butyryl-AMP-dependent CoA disappearance. On the other hand, PP<sub>1</sub> and butyryl-CoA showed antagonistic heterotropic effects when tested under similar conditions. With respect to the overall reaction CoA and ATP could be shown to function as co-operative homotropic modifiers. Two interchangeable conformational states of the enzyme are therefore presumed to exist, state R, having a higher affinity for CoA and ATP and thus preferentially catalysing butyryl-AMP-dependent CoA disappearance (partial reaction b), and state T, favoured by the presence of PP<sub>1</sub>, catalysing the formation of ATP from butyryl-AMP and PP<sub>1</sub> (partial reaction a) with greater efficiency. These findings serve to explain the opposite effects of ATP on the partial reactions, as well as the inhibition by CoA and ATP of ATP formation (reaction a) and by PP<sub>1</sub> of the butyryl-AMP-dependent CoA disappearance (reaction b) (Bar-Tana *et al.* 1968). The possible analogy of these observations to amino acid-activating and other similar systems is discussed.

STUDIES ON MEDIUM-CHAIN FATTY ACYL-COENZYME A SYNTHETASE ENZYME FRACTION II: MECHANISM OF REACTION AND SPECIFIC PROPERTIES. J. Bar-Tana and G. Rose. *Ibid.*, 283-92. The mechanism of reaction of fatty acyl-CoA synthesis by fatty acyl-CoA synthetase from ox liver was investigated by a kinetic study of CoA disappearance dependent on butyrate

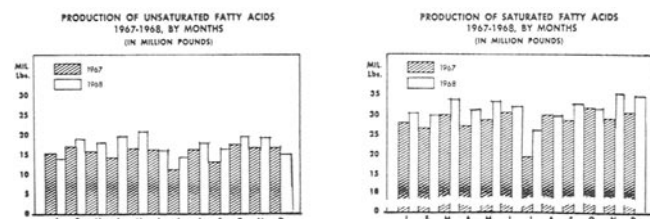
## • Fatty Acid Report

Production of animal, vegetable, and marine fatty acids totalled 49.9 million pounds in January 1969, up 2.5 million pounds from December 1968 (revised) and up 3.7 million pounds from January 1968. Inclusion of the tall oil types raised the overall January 1969 production level to 81.1 million pounds compared with 73.4 million pounds for December 1968.



Disposition of fatty acids amounted to 53.9 million pounds, up 5.5 million pounds from December 1968 and up 3.1 million pounds from January 1968. Including tall oil fatty acids, January 1969 disposition totalled 80.7 million pounds versus 77.1 million pounds in December.

Stocks of fatty acids, other than the tall oil types, amounted to 33.1 million pounds on January 31, down 1.5 million pounds from the end of December (revised).



Source: Pulp Chemicals Assoc., 60 East 42nd Street, New York, New York 10017.

plus ATP or butyryl-AMP (overall and partial reaction, respectively). An ordered Ter Ter mechanism with an A-C-B (standing for ATP, CoA and butyrate respectively) sequence of substrate entry for the overall reaction was established for fraction II. Partial reaction was found to follow the Iso-Theorell-Chance' mechanism. Also, in contrast with results obtained with fraction I, no allosteric properties could be demonstrated with fraction II.

THYROID-STIMULATING HORMONE AND PROSTAGLANDIN E<sub>1</sub> STIMULATION OF CYCLIC 3',5'-ADENOSINE MONOPHOSPHATE IN THYROID SLICES. T. Kaneko, U. Zor and J. B. Field (Dept. of Med., Univ. of Pittsburgh School of Med., Pittsburgh, Pa.). *Science* 163, 1062-63 (1969). Thyroid-stimulating hormone increased the cyclic 3',5'-adenosine monophosphate concentration in dog thyroid slices during a 1-minute incubation period and produced a maximum effect soon thereafter. The elevation persisted for at least 30 minutes. The concentrations of cyclic 3',5'-adenosine monophosphate increased as the TSH concentration was increased from 0.125 to 50 milliunits per milliliter. Prostaglandin E<sub>1</sub>, which increased glucose oxidation in dog thyroid slices, also increased the concentration of cyclic 3',5'-adenosine monophosphate. Although sodium fluoride stimulated thyroid adenylyl cyclase, it did not increase concentration of cyclic 3',5'-adenosine monophosphate. Carbamylcholine and menadiol sodium diphosphate augment glucose oxidation in dog thyroid slices but do not change concentrations of cyclic 3',5'-adenosine monophosphate.

MICROSOMES, MICROSOMAL PHOSPHOLIPIDS, AND FATTY ACID SYNTHESIS. D. W. Foster and W. P. McWhorter (Dept. of Internal Med., Univ. of Texas Southwest. Med. School at Dallas, Dallas, Texas 75235). *J. Biol. Chem.* 244, 260-67 (1969). The effect of microsomes on fatty acid synthesis by the soluble fraction of rat liver cells has been studied. It was shown that the microsomes contain a heat-labile inhibitory factor, presumably ATPase, and a heat-stable stimulatory factor. The latter was localized in the membranes of the endoplasmic reticulum and could be activated by treatment with Pronase. The factor was extractable in lipid solvents and was shown to

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## • Four Corners . . .

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### Panama . . . . . Javier Guardia

#### Oilseed Developments

##### African Palm

Cultivation of African Palm has been steadily increasing in Panama in the last few years. Presently, production exceeds the demand of palm oil for the production of shortening and margarine. Unlike the neighboring countries, however, there is little consumption of margarine in Panama, even though the products manufactured by the local industries are of high quality. Consumers prefer butter, which has been imported in large quantities from New Zealand.

##### Cotton

On the other hand, the production of cotton in Panama has been small. Growers are planning to use more land in order to increase production. Cottonseed has not been processed by the local oilseed crushers since their mills are not equipped for delinting, and thus cottonseed is being exported. However, as production increases, it is expected that local processors will install delinting equipment and the need to import crude oils from abroad will be reduced.

#### Toilet Soaps

This year, for the first time in Panama, toilet soaps have been produced locally. Producers have been using tallow from slaughter houses and coconut oil from locally produced copra. The tallow obtained in Panama has very high titer and is balanced with imported tallow of lower titer. As the demand for tallow is larger than the quantities available, there will not be a surplus of the local production.

### Paraguay . . . . Antonio R. Pandolfi

In their plant near Asunción, Compañía Algodonera Paraguaya S.A. (CAPSA) is beginning installation of a complete new refinery for the production of high quality

edible fats and oils which will benefit the Paraguayan and LAFTA (Latin American Free Trade Association) markets.

The project comprises an Alfa Laval degumming and neutralizing plant, lecithin dryer, batch and continuous oil bleaching plants, batch high temperature high vacuum deodorizer, continuous Wurster & Sanger deodorizer with fatty acid condensing unit, electrolytic hydrogen generation plant, Buss hardening plant, Buss batch splitting and glycerine concentration plants, and a new continuous Wurster & Sanger glycerine distillation plant.

CAPSA is also installing a Sidel blow moulding machine for production of their own PVC bottles for liquid oils. These will be filled in a Strunck specially designed line for continuous filling, capping and labeling. The margarine and shortening plant will have a Schroeder Universal Combinator whose products will be presented in PVC tubes, that will be made, filled, covered and aluminum-sealed in a continuous Thermo-forming unit. Fatty acids will be flaked in a continuous Schroeder colling drum.

CAPSA has been producing Palm oil of high free fatty acid content from the meat of Mbocaya (*Acrocomia Totai*, Mart) a typical Paraguayan Palm tree. This oil differs from the known Red Palm oil insofar as it is liquid at ambient temperature, owing to a lower content of palmitic acid (24/25%, the remaining consisting of oleic acid). Since it has not been possible to refine this oil using standard procedures a new combined method of refining it was developed. The oil is purified, degummed and bleached in the miscella stage; later it is steam-refined in the continuous Wurster & Sanger deodorizer. Recovered distilled fatty acids are used for high grade technical uses (toilet soaps, cosmetics, etc.) because of their particular composition. After winterization, the refined oil is sold as liquid edible oil for margarines with or without hardening.

Palm kernel oil has already been produced in this plant; it is derived from the same fruit, with the unusual characteristics of having a high iodine value (30 units). Cottonseed and soybean oils have also been produced and production of stearic acid derived from tallow is being planned for the near future.

The new refinery is expected to start operating in the second half of 1969.

## ABSTRACTS: BIOCHEMISTRY AND NUTRITION

(Continued from page 335A)

be phospholipid in nature. Synthetic phospholipids also stimulated fatty acid synthesis, while preliminary treatment of microsomes with phospholipase C removed stimulatory activity. The factor was shown to activate hepatic acetyl coenzyme A carboxylase and presumably stimulated fatty acid synthesis in the soluble fraction by this mechanism.

FATTY ACID COMPOSITION OF SERUM LIPIDS IN 5-YEAR-OLD WHITE CARNEAU AND SHOW RACER PIGEONS. F. Young (Dept. of Food and Nutr. Sciences, Univ. of Hawaii, Honolulu, Hawaii). *Proc. Soc. Exp. Biol. Med.* 130, 980-83 (1969). A comparative study was made of the fatty acid compositions of serum glycerides, phospholipids, and sterol esters of White Carneau pigeons (WC) which are susceptible to naturally-occurring aortic atherosclerosis and Show Racer pigeons (SR) which are resistant. The significantly lower proportion of arachidonic acid in the serum sterol esters of 8-month-old WC compared to SR was not observed in 5-year-old pigeons. No significant difference was observed in the fatty acid compositions of the three lipid fractions between 5-year-old WC and SR. Significant differences in the fatty acid compositions of all three serum lipid fractions were found between F<sub>1</sub> generation of SR × WC and either one of their parent breeds. Significant changes in the fatty acid composition of serum sterol esters were noted between 8-month-old and 5-year-old pigeons of both breeds.

BIMOLECULAR LIPID MEMBRANES: A REVIEW AND A SUMMARY OF SOME RECENT STUDIES. H. T. Tien and A. L. Diana (Dept. of Biophys., Michigan State Univ., East Lansing, Mich.). *Chem. Phys. Lipids* 2, 55-101 (1968). The bimolecular lipid membranes of Rudin-Mueller-Tein-Wescott type have been subjected to intensive investigations owing to their striking physical and chemical properties which are similar to those of cell membranes. In addition to biological relevance, these ultrathin structures are a new type of interfacial phenomenon

which should also be of interest because of their pertinence in furthering the understanding of colloid and interfacial chemistry. The literature of bimolecular lipid membranes (BLM), including abstracts, has been reviewed through January, 1967. Also included are some recent studies from this and several other laboratories.

JUVENILE HORMONE: ACTIVITY OF AROMATIC TERPENOID ETHERS. W. S. Bowers (Insect Physiol. Lab., Entomology Res. Div., Agr. Res. Service, Beltsville, Maryland). *Science* 164, 323-5 (1969). Several aromatic terpenoid ethers possess a high degree of morphogenetic activity when assayed on the yellow mealworm *Tenebrio molitor* L. and the milkweed bug *Oncopeltus fasciatus* (Dallas). The most active compounds were the 3,4-methylenedioxy-phenyl ethers of 6,7-epoxygeraniol and the corresponding ethyl-branched homologs.

VITAMIN A AND THE BIOSYNTHESIS OF SULPHATED MUCOPOLYSACCHARIDES. D. B. Thomas and C. A. Pasternak (Dept. of Biochem., Univ. of Oxford) *Biochem. J.* 111, 407-412 (1969). The uptake and incorporation of sulphate-<sup>35</sup>S into mucopolysaccharides by colon and duodenum *in vitro* are unaffected by the vitamin A status of the animals. Uptake and incorporation *in vivo* are unaffected 4 hours after injection of sulphate-<sup>35</sup>S, but at later times are decreased in some tissues of vitamin A-deficient animals. The rate of removal of <sup>35</sup>S from blood, its rate of appearance in urine, the plasma concentration of sulphate and the uronic acid content of several tissues are not significantly altered in vitamin A deficiency. These results, and direct measurement of <sup>35</sup>S in mucopolysaccharides at various times after injection of sulphate-<sup>35</sup>S, suggest that the synthesis of mucopolysaccharides is unaffected but that their turnover is increased in vitamin A deficiency. Neither the growth rate of, nor the incorporation of sulphate-<sup>35</sup>S into heparin by, P 815 Y and HC cultured neoplastic mast cells is decreased when the horse serum necessary for growth

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is treated with ultraviolet light or is replaced by serum from vitamin A-deficient rats. The addition of citral is no more toxic to growth rate or to incorporation of  $^{35}\text{S}$  than is the addition of vitamin A itself. It is concluded that neoplastic mast cells in culture do not require vitamin A for growth or for the synthesis of heparin. None of these results is compatible with the view that vitamin A or a derivative is directly involved in the biosynthesis of sulphated mucopolysaccharides.

**SEMICONDUCTIVE PROPERTIES OF LIPIDS AND THEIR POSSIBLE RELATIONSHIP TO LIPID BILAYER CONDUCTIVITY.** B. Rosenberg and G. L. Jendrsiak (Biophysics Dept., Michigan State Univ., East Lansing, Mich.). *Chem. Phys. Lipids* 2, 47-54 (1968). The de semiconductive behavior of lipid films (cholesterol palmitate, egg lecithin and synthetic lecithin) has been studied. Although these lipids are insulators in the dry state, they exhibit conductivities at least  $10^8$  times higher in the fully hydrated condition. The semiconduction activation energies for the "dry" and fully hydrated states of these films have been measured: for synthetic lecithin, the "dry" activation energy has values of 4.8 to 6.3 eV depending upon the sample, while for cholesterol palmitate the values range from 2.9 to 3.5 eV. The fully hydrated values for the lecithins range from 1.7 to 2.8 eV, whereas those for the cholesterol palmitate are 1.2 to 1.9 eV. For egg lecithin, an effect paralleling that for hydration is found upon exposure of the film to iodine vapor. Lipid bilayers, formed from egg lecithin, exhibit resistance values of  $10^6/\text{cm}^2$  when formed in distilled water. Addition of iodine to the water drops the resistance to less than  $10^4/\text{cm}^2$ . Spectroscopic evidence indicates that iodine forms a donor-acceptor complex both with egg lecithin films and egg lecithin bilayers. The increase in electrical conductivity in both the lipid films and lipid bilayers is taken to be due to the formation of this donor-acceptor complex. Since all presently known donor-acceptor complexes are electronic conductors, this is taken as suggestive of an electronic conduction mechanism in the bilayer.

**THE ACTION OF CERTAIN ANTIBIOTICS ON MITOCHONDRIAL, ERYTHROCYTE AND ARTIFICIAL PHOSPHOLIPID MEMBRANES. THE ROLE OF INDUCED PROTON PERMEABILITY.** P. J. F. Henderson, J. D. McGivan and J. B. Chappell (Dept. of Biochem., Univ. of Bristol). *Biochem. J.* 111, 521-535 (1969). The action of the antibiotics enniatin A, valinomycin, the actin homologues, gramicidin, nigericin and dianemycin on mitochondria, erythrocytes and smectic mesophases of lecithin-dicetyl hydrogen phosphate was studied. These antibiotics induced permeability to alkali-metal cations on all three membrane systems. The ion specificity on each membrane system was the same. Enniatin A, valinomycin and the actins did not induce permeability to protons, whereas nigericin and dianemycin rendered all three membrane systems freely permeable to protons. Several differences were noted between permeability induced by nigericin and that induced by gramicidin. The action of all these antibiotics on mitochondrial respiration could be accounted for by changes in passive ion permeability of the mitochondrial membrane similar to those induced in erythrocytes and phospholipid membranes, if it is assumed that a membrane potential is present in respiring mitochondria.

**TRIGLYCERIDE SYNTHESIS BY SMALL-INTESTINAL EPITHELIUM OF THE PIG, SHEEP AND CHICKEN.** R. Bickerstaffe and E. F. Annison (Unilever Res. Lab., Colworth House, Sharnbrook, Bedford). *Biochem. J.* 111, 419-429 (1969). A comparative study was made of triglyceride synthesis by the intestinal epithelium of pigs, sheep and chickens. In pig and chicken tissue both the glycerol 3-phosphate and the monoglyceride pathway of triglyceride synthesis were operative, but the former pathway predominated in sheep tissue. The fatty acid specificity of the glycerol 3-phosphate pathway was studied in pig and sheep total-homogenate preparations. Maximum incorporation was obtained with myristic acid and palmitic acid under optimum conditions for each fatty acid. Lauric acid, myristic acid, oleic acid, linoleic acid and linolenic acid were inhibitory at concentrations above their optimum, but octanoic acid, decanoic acid, palmitic acid and stearic acid did not show this effect. Subcellular fractionation located the glycerol 3-phosphate and monoglyceride pathways of triglyceride synthesis in the microsomes in all instances. Phosphatidate phosphohydrolase was associated with both the microsomes and the particle-free supernatant. Glycerol 1-mono-oleate was incorporated into triglycerides to a greater extent than glycerol 1-monopalmitate or glycerol 1-monostearate by microsomal preparations from pig and chicken. A lipase specific for monoglycerides was detected in the particle-free supernatant of all the species examined.

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## • Detergents

**DETERGENT COPOLYMER ACYL AMIDO ALKYL ETHERS OF POLY-ALKYLENE GLYCOL.** F. A. Stuart, W. T. Stewart, W. Lowe and F. W. Kavanagh (Chevron Research Co.). *U.S.* 3,428,615. An oil-soluble polymer is described, produced from (A) polymerizable oil-solubilizing compounds having a single ethylenic linkage and containing a monovalent  $\text{C}_8\text{-C}_{20}$  hydrocarbon group, and (B) at least one ethylenically unsaturated acyl amido alkyl ether of polyalkylene glycol having molecular weight between 220 and 30,000, the acyl group containing 3-20 C atoms and the amido alkyl group containing 2-7 C atoms. The weight ratio of A to B should be between 40/60 and 96/4.

**CONTINUOUS SULFONATION PROCESS.** R. J. Brooks and B. Brooks (Chemithon Corp.). *U.S.* 3,427,342. A continuous process for sulfonating a sulfonatable organic reactant by reaction with sulfur trioxide is claimed. The process comprises passing parallel streams of the organic reactant and a mixture of sulfur trioxide and a gaseous-inert diluent into a reaction zone without any pre-reaction taking place between the sulfur trioxide and the organic reactant. The two streams are thoroughly mixed in the reaction zone and rapidly cooled, the reaction zone consisting of two externally cooled, concentric, circular reaction surfaces.

**METHOD FOR PRODUCING DETERGENT-GRADE ALKYLATE.** D. B. Carson and R. A. Lengemann (Universal Oil Products Co.).

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*U.S. 3,426,092.* A method is described for producing detergent-grade alkylate via n-paraffin separation, n-paraffin dehydrogenation to the corresponding mono-olefin, catalytic alkylation of the olefin with benzene, and separation of the desired alkylate product. The method is applicable particularly to the production of alkylbenzenes having a 5-carbon homolog spread, such as C<sub>10</sub> to C<sub>14</sub>, in the alkyl side-chain.

**LOW FOAMING BIODEGRADABLE SURFACTANT COMPOSITION.** F. S. Eiseman, Jr. and L. M. Schenk (GAF Corp.). *U.S. 3,426,077.* Novel low-foaming and biodegradable non-ionic chloride surfactant compositions having good detergency are described. These surfactants are the chlorides of non-ionic surfactants obtained by condensing one mol of a straight chain C<sub>8</sub>-C<sub>12</sub> alkanol with 6.7 to 20.8 mols of ethylene oxide.

**COMPOSITION AND PROCESS FOR LIGHT-WEIGHT SURFACTANT PRODUCTS.** J. V. Otrhalek and P. E. Luoma (Wyandotte Chemicals Corp.). *U.S. 3,425,948.* Discrete, hollow detergent particles are produced by subjecting a mass of finely divided solid alkali carbonate particles to a tumbling action by a continuously moving surface such as a rotating pan tilted at an angle. During tumbling, the alkali carbonate particles are sprayed with an acid reacting surface active material whereby a neutralization reaction occurs and carbon dioxide is released, resulting in the formation of discrete, hollow particles of detergent material.

**FOOD SPREADS CONTAINING OLEAGINOUS GELS.** C. Japikse (Procter & Gamble Co.). *U.S. 3,425,842.* A food spread is made from about 1-10% by wt. milk solids, 5-50% by wt. water and 45-90% by wt. of an oleaginous gel. This gel has a stable beta crystalline phase comprising 92-98% by wt. of liquid glyceride oil having an I.V. of 100-120 and 2-8% by wt. of solid triglyceride having an I.V. not exceeding about 12. The solid triglyceride consists essentially of a blend of (a) beta-phase tending hardstock and (b) non-beta-phase-tending hardstock having a substantial portion of C<sub>20</sub>-C<sub>24</sub> fatty acid groups. The weight proportion of (a) to (b) in the solid triglyceride blend ranges from about 1:4 to about 4:1.

The solid triglycerides have stable individual crystals up to about 10 microns, at least 70% being in the beta phase.

**MIXTURE OF SURFACE-ACTIVE COMPOUNDS AND PROCESS FOR PREPARING SAME.** W. Stein, H. Baumann and M. Voss (Henkel & Cie., G.m.b.H.). *U.S. 3,424,694.* The process described in U.S. 3,424,693 is also applicable to surface-active compounds obtained by reacting non-alpha olefins with sulfur trioxide.

**NOVEL AMIDO DERIVATIVES USEFUL AS AIDS IN DETERGENT COMPOSITIONS.** L. H. Libby and M. G. Libby (Lumin Chemical Co.). *U.S. 3,424,771.* Compounds of the following two general formulas are claimed: RCONHCH<sub>2</sub>CH<sub>2</sub>NHCH<sub>2</sub>CH(CH<sub>3</sub>)CONH<sub>2</sub> and RCONHCH<sub>2</sub>CH<sub>2</sub>N(CH<sub>2</sub>CH<sub>2</sub>CONH<sub>2</sub>)<sub>2</sub> where R is selected from the group consisting of C<sub>8</sub>-C<sub>20</sub> saturated and unsaturated hydrocarbon groups.

**ELECTRONIC STUDIES OF NICKEL-NICKEL SOAP ELECTRODE IN DETERMINING THE CRITICAL MICELLE CONCENTRATION OF SOAP SOLUTIONS.** W. V. Malik and A. K. Jain (Dept. of Chem., Univ. of Roorkee, Roorkee, India). *Indian Oil Soap. J. 34, 7-11 (1968).* The variation in detergent anion activity with concentration of solutions of potassium laurate, myristate, palmitate and stearate has been studied using a nickel-nickel soap electrode. The detergent anion activity increases in the beginning, reaches maximum at a critical micelle concentration (c.m.c.) and thereafter remains almost constant. The constant value of activity above c.m.c. shows that the soap added goes into solution in the form of micelles. The values of c.m.c. of potassium laurate, myristate, palmitate and stearate are 2.427 × 10<sup>-2</sup>M, 6.761 × 10<sup>-3</sup>M, 3.02 × 10<sup>-3</sup>M and 8.511 × 10<sup>-4</sup>M respectively. The values of the c.m.c. of the soaps determined by the present method are in good agreement with those found by other methods. In the presence of urea the micellization of potassium laurate and myristate takes place at higher concentrations.

**EVALUATION OF HARD SURFACE CLEANING.** R. R. Alder, T. B. Albin and B. M. Finger (Shell Chemical Co.). *Soap Chem. Specialties 45(1), 66-72 (1969).* A quantitative method for evaluating performance of hard surface cleaners is described. The method is based on mechanical cleaning of artificially soiled linoleum using the Gardner Straight Line Washability Machine. Relative cleaning efficiency is determined photometrically. The artificial soil used consisted of a metallic brown oxide pigment dispersed in a solvent/oil mixture.

**DETERGENT ALKYLATE: WORLD STATUS.** H. A. W. Hill, T. H. Butler and J. G. Moffett, Jr. (Shell International Chem. Co.). *Soap Chem. Specialties 45(2), 37-40, 78-80 (1969).* A review is given of technical and economic factors concerning the market position of detergent alkylates.

**BLEACHING TABLET.** B. Weinstein, D. H. Terry and H. S. Jensen (American Home Products Corp.). *U.S. 3,429,821.* A crush-resistant, easily soluble bleaching tablet consists essentially of: 15-50 parts by wt. of dichlorocyanuric acid or its alkali metal salts; 20-50 parts by wt. of an alkali metal triphosphosphate, tetraprophosphate or trimetaphosphate; 20-30 parts by wt. of sodium chloride or sodium sulfate, and 1-3 parts by wt. of a soap composition consisting of 10-15 parts by wt. sodium coconut soap and 85-90 parts by wt. sodium tallow soap.

**DETERGENT COMPOSITIONS.** H. Grunewald and A. Waag (Mö och Domsjö Aktiefbolaget). *U.S. 3,429,822.* A water-soluble surface active detergent having low foaming tendency and good cleansing power contains (a) a water-soluble surface-active ethylene oxide adduct having good cleansing power and a high foaming tendency and (b) a water-insoluble water-dispersible surface-active dialkylphenol-ethylene oxide adduct having low foaming tendency and relatively poor cleansing power, in an amount to reduce the foaming tendency of (a) without substantially impairing its cleansing power.

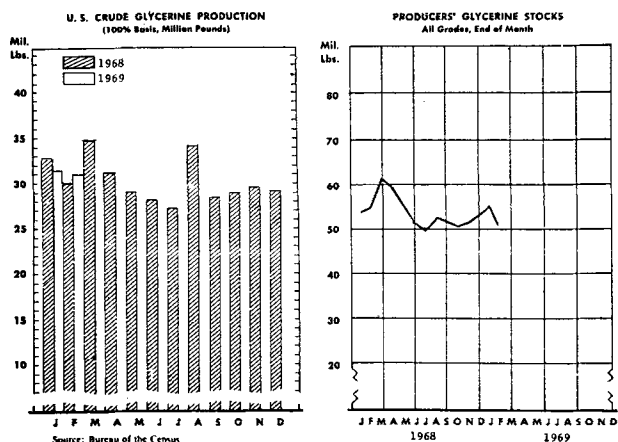
**PROCESS FOR PURIFYING STEARIC ACID.** S. Serota and H. E. Kenney (U.S. Sec'y of Agr.). *U.S. 3,429,902.* Stearic acid is purified by crystallization at ambient room temperatures from a solvent mixture consisting of about 96-97% petroleum ether and about 3-4% methylene chloride. The process eliminates the need for low-temperature crystallization and large volumes of solvent.

**DETERGENT.** V. Lamberti and H. Lemair (Lever Bros. Co.). *U.S. 3,427,248.* The specification is concerned with certain polyolethers, polyolpolyethers or sulfur analogs thereof which can be used alone as a detergent or in combination with other compounds.

## Glycerine Production Report

According to the U.S. Department of Commerce, production of crude glycerine (including synthetic) for February 1969 totalled 30.8 million pounds, down 0.4 million pounds from January (revised), but up 0.8 million pounds from February 1968.

At the end of February, producers' stocks of crude and refined glycerine totalled 51.0 million pounds, down 5.0 million pounds from January (revised), and down 3.8 million pounds from the end of February last year.



The crude production and stocks figures originally reported for January 1969 have been revised, as follows, in millions of pounds, 100% basis: crude production, from 30.4 to 31.2; crude stocks from 25.3 to 25.6. These revisions raised the January 1969 total stocks figure from 55.7 to 56.0 million pounds, and domestic disappearance from 24.4 to 24.9 million pounds.